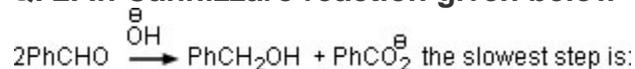


Q. 1. Arrange the carbanions $(CH_3)_3 \bar{C}$, $\bar{C}Cl_3$, $(CH_3)_2 \bar{C}H$, $C_6H_5\bar{C}H_2$, in order of their decreasing stability:

1. $(CH_3)_3 \bar{C} > (CH_3)_2 \bar{C}H > C_6H_5\bar{C}H_2 > \bar{C}Cl_3$
2. $C_6H_5\bar{C}H_2 > \bar{C}Cl_3 > (CH_3)_3 \bar{C} > (CH_3)_2 \bar{C}H$
3. $(CH_3)_2 \bar{C}H > \bar{C}Cl_3 > C_6H_5\bar{C}H_2 > (CH_3)_3 \bar{C}$
4. $\bar{C}Cl_3 > C_6H_5\bar{C}H_2 > (CH_3)_2 \bar{C}H > (CH_3)_3 \bar{C}$

Answer : (4)

Q. 2. In Cannizzaro reaction given below



1. the deprotonation of PhCH_2OH
2. the attack of $:\overset{\ominus}{\text{O}}\text{H}$ at the carboxyl group
3. the transfer of hydride of the carbonyl group
4. the abstraction of proton from the carboxylic group

Answer : (3)

Q. 3. Two liquids X and Y form an ideal solution. At 300 K, vapour pressure of the solution containing 1 mol of X and 3 mol of Y is 550 mmHg. At the same temperature, if 1 mol of Y is further added to this solution, vapour pressure of the solution increases by 10 mmHg. Vapour pressure (in mmHg) of X and Y in their pure states will be, respectively:

1. 500 and 600
2. 200 and 300

3. 300 and 400

4. 400 and 600

Answer : (4)

Q. 4. In a fuel cell, methanol is used as fuel and oxygen gas is used as an oxidizer. The reaction is $CH_3OH(l) + 3/2O_2(g) \rightarrow CO_2(g) + 2H_2O(l)$; At 298 K standard Gibb's energies of formation for $CH_3OH(l)$, $H_2O(l)$ and $CO_2(g)$ are -166.2 , -237.2 and $-394.4 \text{ kJ mol}^{-1}$ respectively. If standard enthalpy of combustion of methanol is -726 kJ mol^{-1} , efficiency of the fuel cell will be

1. 97%

2. 80%

3. 87%

4. 90%

Answer : (1)

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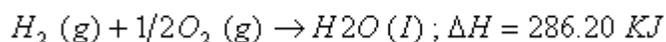
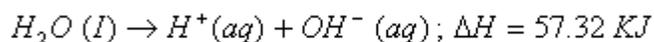
3. 87%

4. 90%

Answer : (1)

Q. 5. On the basis of the following thermochemical

$$\left(\Delta_f G^0 H_{(aq)}^+ = 0\right)$$



data: *The value of enthalpy of formation of OH^- ion at $25^\circ C$ is :*

1. -343.52 kJ
2. -22.88 kJ
3. -228.88 kJ
4. +228.88 kJ

Q. 6. The half life period of a first order chemical reaction is 6.93 minutes. The time required for the completion of 99% of the chemical reaction will be ($\log 2 = 0.301$):

1. 460.6 minutes
2. 230.3 minutes
3. 23.03 minutes
4. 46.06 minutes

Answer : (4)

Q. 7. Copper crystallises in fcc with a unit cell length of 361 pm. What is the radius of copper atom?

1. 181 pm
2. 108 pm
3. 127 pm
4. 157 pm

Answer : (3)

Q. 8. Given $E^0_{Fe^{3+}/Fe} = -0.036 V$. $E^0_{Fe^{2+}/Fe} = -0.439 V$. The value of standard electrode potential for the change, $Fe^{3+}(aq) + e^- \rightarrow Fe^{2+}(aq)$ will be

1. -0.270 V
2. -0.072 V
3. (3) 0.385 V
4. (4) 0.770 V

Answer : (4)

Q. 9. In which of the following arrangements, the sequence is *not* strictly according to the property written against it?

1. B < C < O < N; increasing first ionization enthalpy
2. CO₂ < SiO₂ < SnO₂ < PbO₂: increasing oxidising power
3. HF < HCl < HBr < HI: increasing acid strength
4. NH₃ < PH₃ < AsH₃ < SbH₃: increasing basic strength

Answer : (4)

Q. 10. Knowing that the chemistry of lanthanoids (Ln) is dominated by its +3 oxidation state, which of the following statements is *incorrect*?

1. Ln (III) hydroxides are mainly basic in character.
2. Because of the large size of the Ln (III) ions the bonding in its compounds is predominantly ionic in character.
3. The ionic sizes of Ln (III) decrease in general with increasing atomic number.
4. Ln (III) compounds are generally colourless.

Answer : (4)

Q. 11. The set representing the *correct* order of ionic radius is:

1. $Mg^{2+} > Be^{2+} > Li^+ > Na^+$
2. $Li^+ > Be^{2+} > Na^+ > Mg^{2+}$
3. $Na^+ > Li^+ > Mg^{2+} > Be^{2+}$
4. $Li^+ > Na^+ > Mg^{2+} > Be^{2+}$

Answer : (3)

Q. 12. Buna-N synthetic rubber is a copolymer of:

1. $H_2C = CH - CN$ and $H_2C = CH - C = CH_2$
 $\begin{array}{c} | \\ CH_3 \end{array}$
2. $H_2C = CH - C = CH_2$ and $H_2C = CH - CH = CH_2$
 $\begin{array}{c} cl \\ | \end{array}$
3. $H_2C = CH - CH = CH_2$ and $H_3C_6 - CH = CH_2$
4. $H_2C = CH - CN$ and $H_2C = CH - CH = CH_2$

Answer : (4)

Q. 12. Buna-N synthetic rubber is a copolymer of:

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3. $H_2C = CH - CH = CH_2$ and $H_3C_6 - CH = CH_2$
4. $H_2C = CH - CN$ and $H_2C = CH - CH = CH_2$

Answer : (4)

Q. 13. Which of the following statements is *incorrect* regarding physisorption?

1. Enthalpy of adsorption ($\Delta H_{adsorption}$) is low and positive.
2. It occurs because of Van der Waal's forces.
3. More easily liquefiable gases are adsorbed readily.
4. Under high pressure it results into multi molecular layer on adsorbent surface.

Answer : (1)

Q. 14. The number of stereoisomers possible for a compound of the molecular formula $CH_3 - CH = CH - CH(OH) - Me$ is:

1. 6
2. 3
3. 2
4. 4

Isomer 1: cis d ; Isomer 2: cis l ; Isomer 3: trans d ; Isomer 4: trans l

Answer : (4)

Q. 15. The two functional groups present in a typical carbohydrate are:

1. $-OH$ and $-CHO$
2. $-OH$ and $-COOH$
3. $-CHO$ and $-COOH$
4. $>C=O$ and $-OH$

Answer : (4)

Q. 16. Calculate the wavelength (in nanometer) associated with a proton moving at $1.0 \times 10^3 \text{ ms}^{-1}$ (Mass of proton = $1.67 \times 10^{-27} \text{ kg}$ and $h = 6.63 \times 10^{-34} \text{ Js}$):

1. 14.0 nm
2. 0.032 nm

3. 0.40 nm

4. 2.5 nm

Answer: (3)

Q. 17. The bond dissociation energy of B–F in BF_3 is 646 kJ mol^{-1} whereas that of C–F in CF_4 is 515 kJ mol^{-1} . The correct reason for higher B–F bond dissociation energy as compared to that of C–F is

1. lower degree of $p\pi - p\pi$ interaction between B and F in BF_3 than that between C and F in CF_4 .
2. smaller size of B atoms as compared to that of C atom.
3. stronger σ bond between B and F in BF_3 as compared to that between C and F in CF_4
4. significant $p\pi - p\pi$ interaction between B and F in BF_3 whereas there is no possibility of such interaction between C and F in CF_4 .

Answer: (4)

Q. 18. The major product obtained on interaction of phenol with sodium hydroxide and carbon dioxide is:

1. phthalic acid
2. benzoic acid
3. salicylaldehyde
4. salicylic acid

Answer: (4)

Q. 19. Solid $\text{Ba}(\text{NO}_3)_2$ is gradually dissolved in $1.0 \times 10^{-4} \text{ M Na}_2\text{CO}_3$ solution. At what concentration of Ba^{2+} will a precipitate begin to form? (K_{sp} for $\text{BaCO}_3 = 5.1 \times 10^{-9}$):

1. $8.1 \times 10^{-7} \text{ M}$

2. $4.1 \times 10^{-5} M$
3. $5.1 \times 10^{-5} M$
4. $8.1 \times 10^{-8} M$

Answer: (3)

Q. 20. Which one of the following reactions of xenon compounds is *not* feasible?

1. $XeF_6 + RbF \rightarrow Rb [XeF_7]$
2. $XeO_3 + 6HF \rightarrow XeF_6 + 3H_2O$
3. $3XeF_4 + 6H_2O \rightarrow 2Xe + XeO_3 + 12HF + 1.5O_2$
4. $2XeF_2 + 2H_2O \rightarrow 2Xe + 4HF + O_2$

Answer: (2)

Q. 21. The IUPAC name of neopentane is:

1. 2,2-dimethylbutane
2. 2-methylbutane
3. 2,2-dimethylpropane
4. 2-methylpropane

Answer: (3)

Q. 22. In context with the transition elements, which of the following statements is *incorrect*?

1. Once the d^5 configuration is exceeded, the tendency to involve all the 3d electrons in bonding decreases.
2. In addition to the normal oxidation states, the zero oxidation state is also shown by these elements in complexes.
3. In the highest oxidation states, the transition metal show basic character and form cationic complexes.

4. In the highest oxidation states of the first five transition elements (Sc to Mn), all the 4s and 3d electrons are used for bonding.

Answer: (3)

Q. 23. Which of the following pairs represents linkage isomers?

1. $[\text{PtCl}_2(\text{NH}_3)_4]\text{Br}_2$ and $[\text{PtBr}_2(\text{NH}_3)_4]\text{Cl}_2$
2. $[\text{Cu}(\text{NH}_3)_4][\text{PtCl}_4]$ and $[\text{Pt}(\text{NH}_3)_4][\text{CuCl}_4]$
3. $[\text{Pd}(\text{PPh}_3)_2(\text{NCS})_2]$ and $[\text{Pd}(\text{PPh}_3)_2(\text{SCN})_2]$
4. $[\text{Co}(\text{NH}_3)_5\text{NO}_3]\text{SO}_4$ and $[\text{Co}(\text{NH}_3)_5\text{SO}_4]\text{NO}_3$

Answer: (3)

Q. 24. In an atom, an electron is moving with a speed of 600 m/s with an accuracy of 0.005%. Certainty with which the position of the electron can be located

is ($h = 6.6 \times 10^{-34} \text{ Kg m}^2 \text{ s}^{-1}$, mass of electron, = $9.1 \times 10^{-31} \text{ Kg}$):

1. $3.84 \times 10^{-3} \text{ m}$
2. $1.52 \times 10^{-4} \text{ m}$
3. $5.10 \times 10^{-3} \text{ m}$
4. $1.92 \times 10^{-3} \text{ m}$

Answer: (4)

Q. 25. Which of the following on heating with aqueous KOH, produces acetaldehyde?

1. CH_3CHCl_2
2. CH_3COC
3. $\text{CH}_3\text{CH}_2\text{Cl}$
4. $\text{CH}_2\text{C}/\text{CH}_2\text{C}$

Answer: (1)

Q. 26. A liquid was mixed with ethanol and a drop of concentrated H_2SO_4 was added. A compound with a fruity smell was formed. The liquid was:

1. CH_3COOH
2. CH_3OH
3. HCHO
4. CH_3COCH_3

Answer: (1)

Q. 27. Using MO theory predict which of the following species has the shortest bond length?

1. O_2^{2-}
2. O_2^{2+}
3. O_2^+
4. O_2^-

Answer: (2)

Q. 28. A binary liquid solution is prepared by mixing n-heptane and ethanol. Which one of the following statements is *correct* regarding the behaviour of the solution?

1. n-heptane shows +ve deviation while ethanol shows -ve deviation from Raoult's Law.
2. The solution formed is an ideal solution.
3. The solution is non-ideal, showing +ve deviation from Raoult's law.
4. The solution is non-ideal, showing -ve deviation from Raoult's Law.

Answer: (3)

Q. 29. The alkene that exhibits geometrical isomerism is:

1. 2-methyl-2-butene
2. propene
3. 2-methyl propene
4. 2-butene

Answer: (4)

Q. 30. Which of the following has an optical isomer?

1. $[Co(en)_2(NH_3)_2]^{3+}$
2. $[Co(NH_3)_3Cl]^+$
3. $[Co(en)(NH_3)_2]^{2+}$
4. $[Co(H_2O)_4(en)]^{3+}$

Answer: (1)